Physical and Chemical Heterogeneity in the Subsurface:

The Role of Facies in Contaminant Transport

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Objective

Better understand the influence of sediment heterogeneity on contaminant transport

Contaminant mobility in groundwater

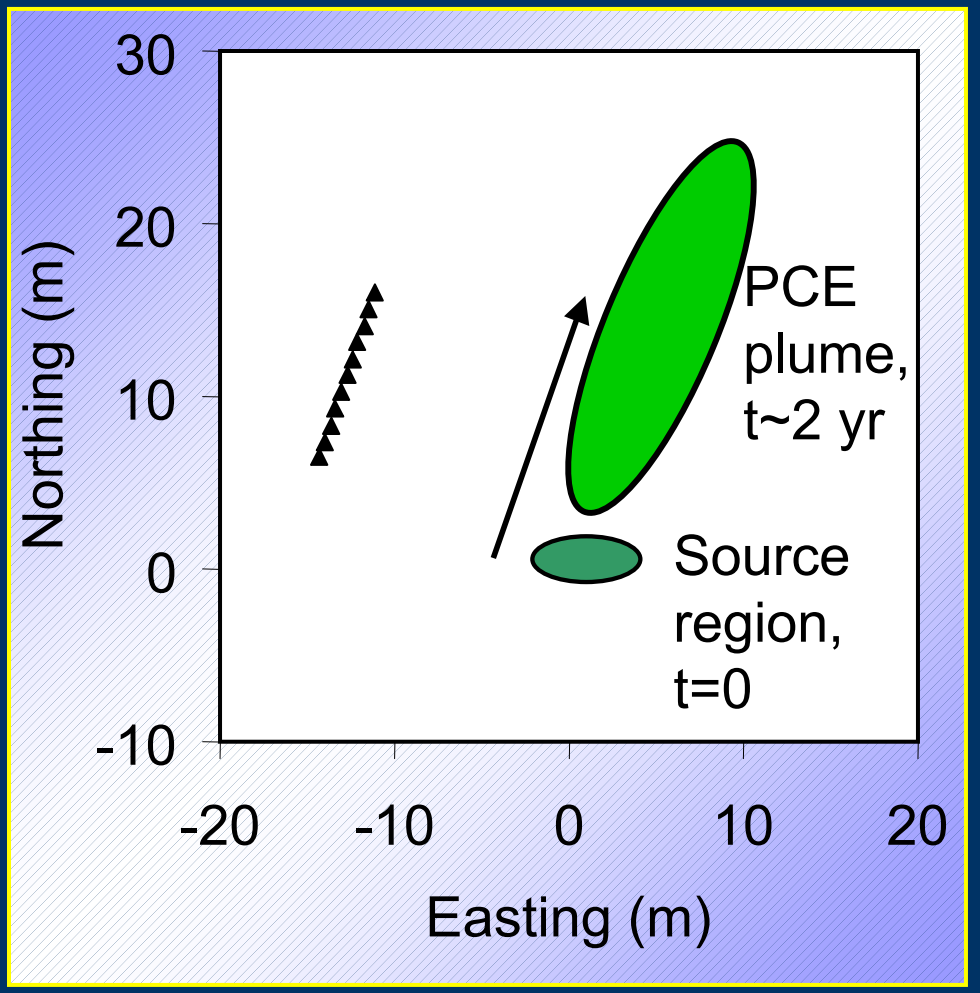
Understanding subsurface variability will allow us to :

- better prioritize remediation sites
- plan efficient remedial designs

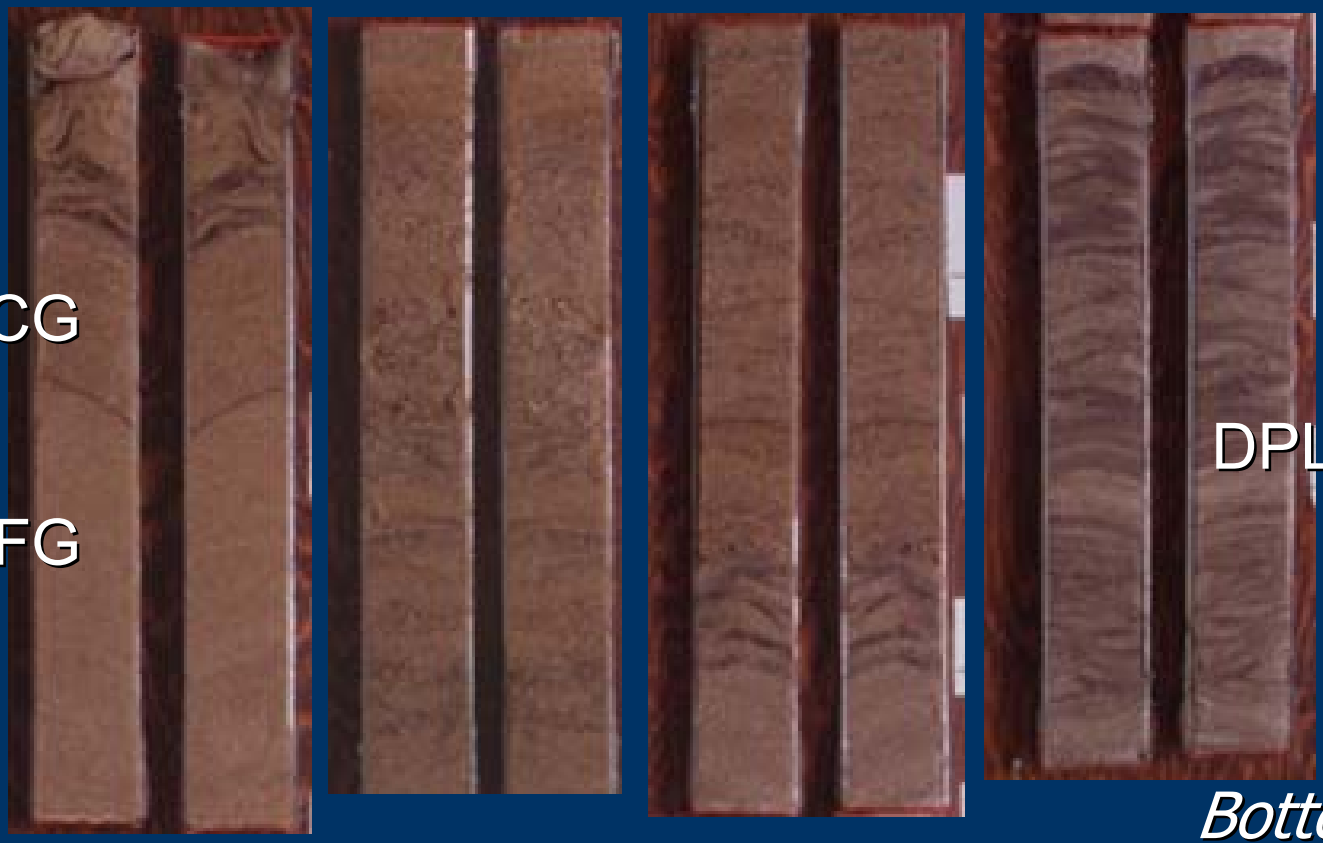
Questions

- What are the spatial distributions of aquifer transport properties?
- Do lithofacies have distinct physical/chemical properties?
- Can a map of lithofacies be used to predict spatial distribution of properties?

Sediment cores

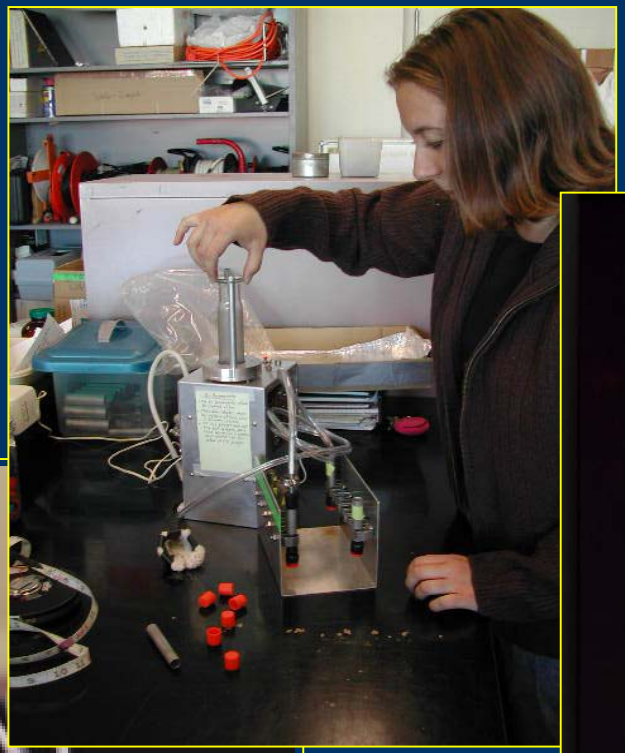


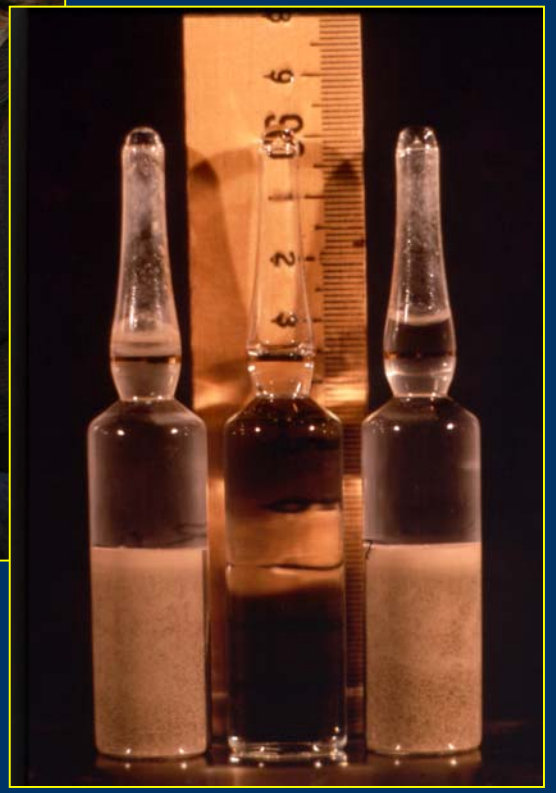
How do sediment properties vary spatially?



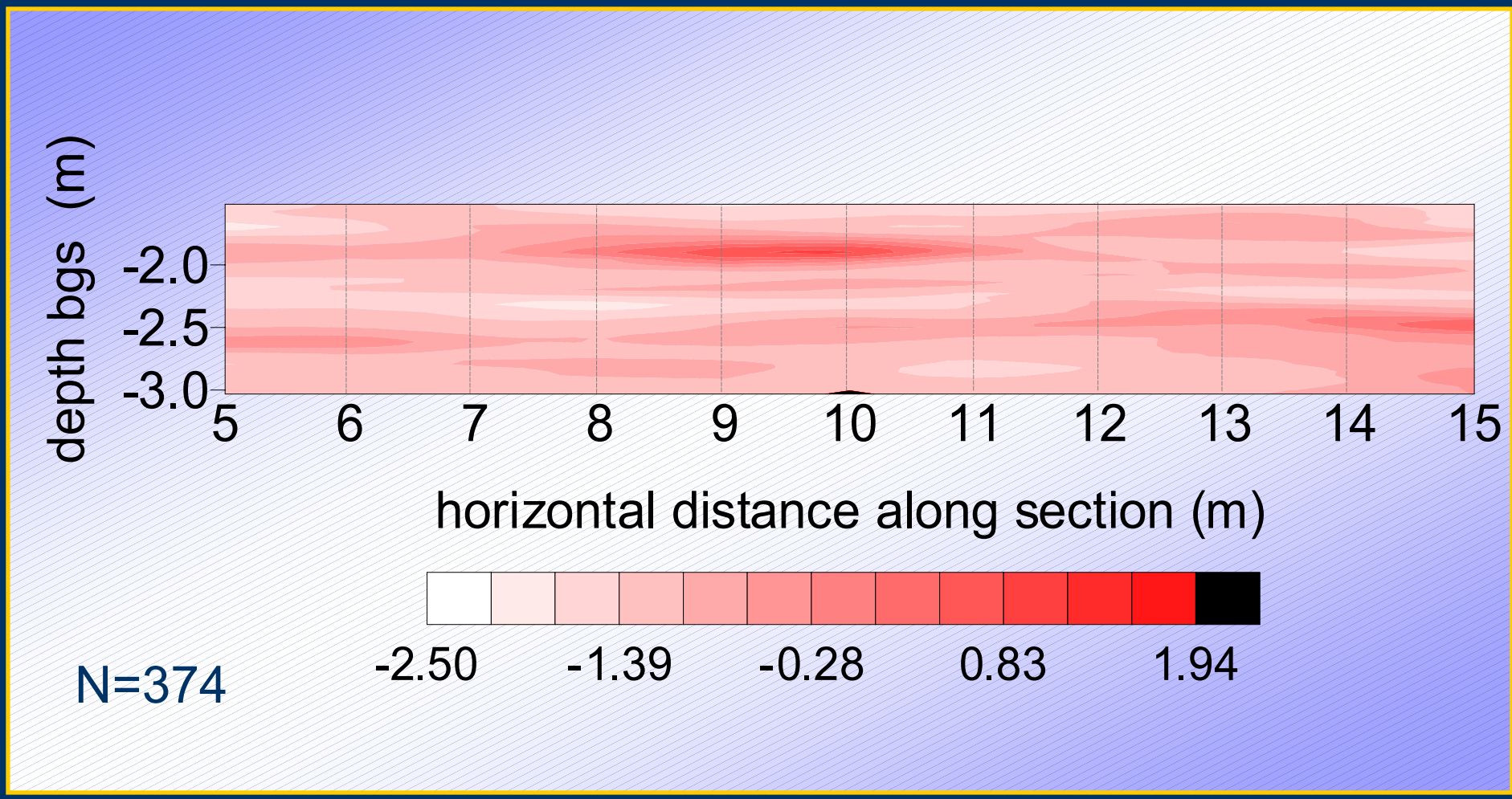
MCG=massive coarse grained
MFG=massive fine grained
DPL=distinct plane laminated

Map lithofacies, measure permeability and sorption

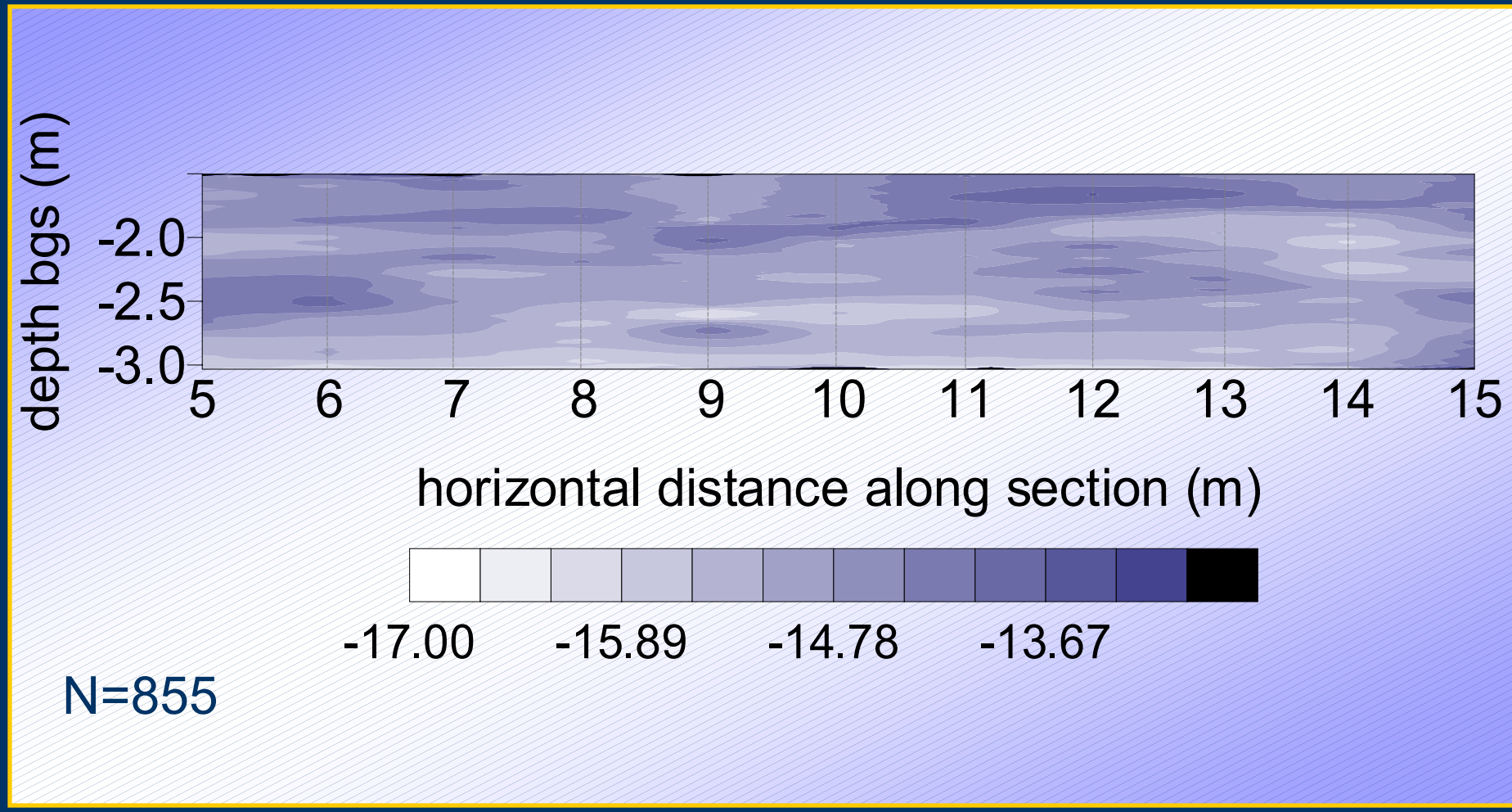




Spatial distribution of ln (Kd)

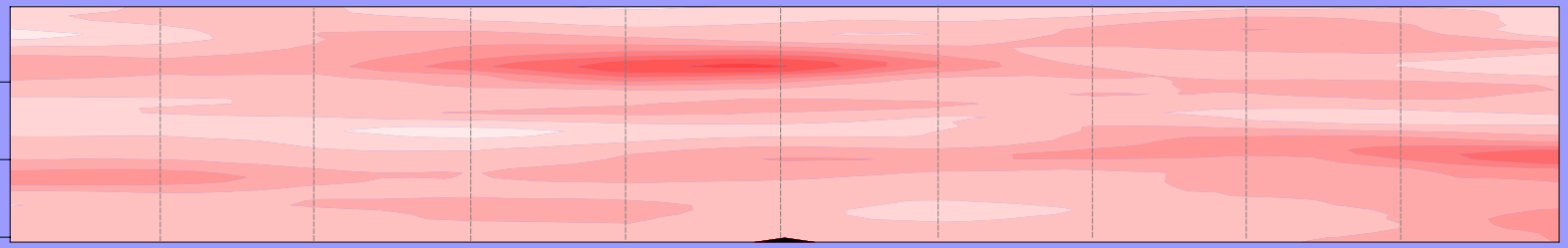


Spatial distribution of ln (k)

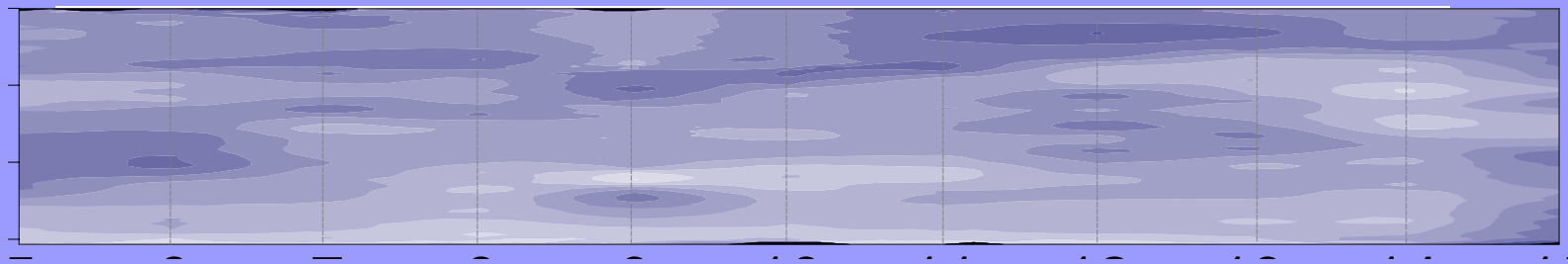


Comparison between distributions – same variance!

Ln K_d (sorption)



Ln k (permeability)



Transport implications

- "Lenses" of high sorption will result in enhanced plume-scale dispersivity for reactive solutes

- second order plume dynamics consistent with geochemical controls!

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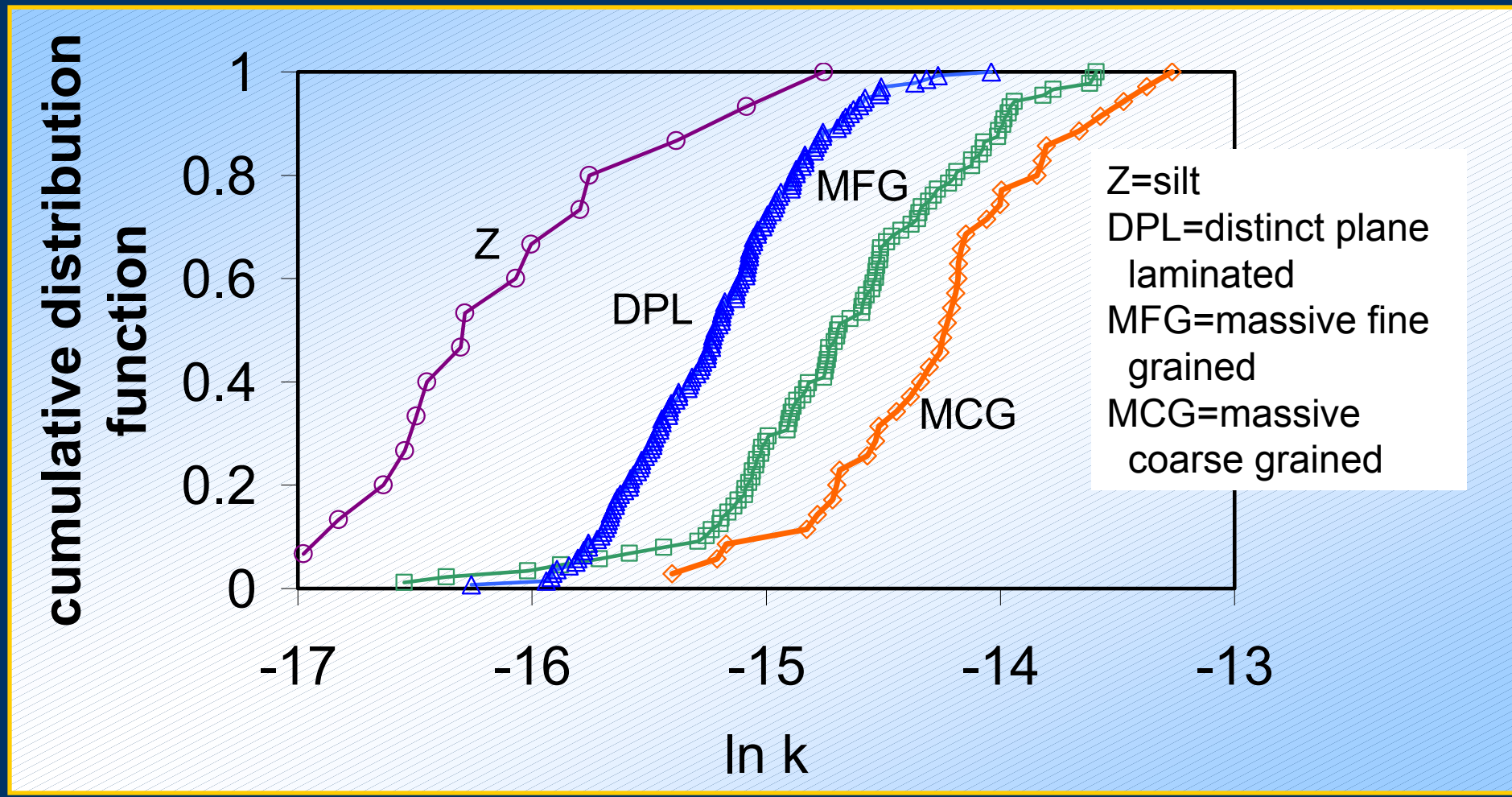
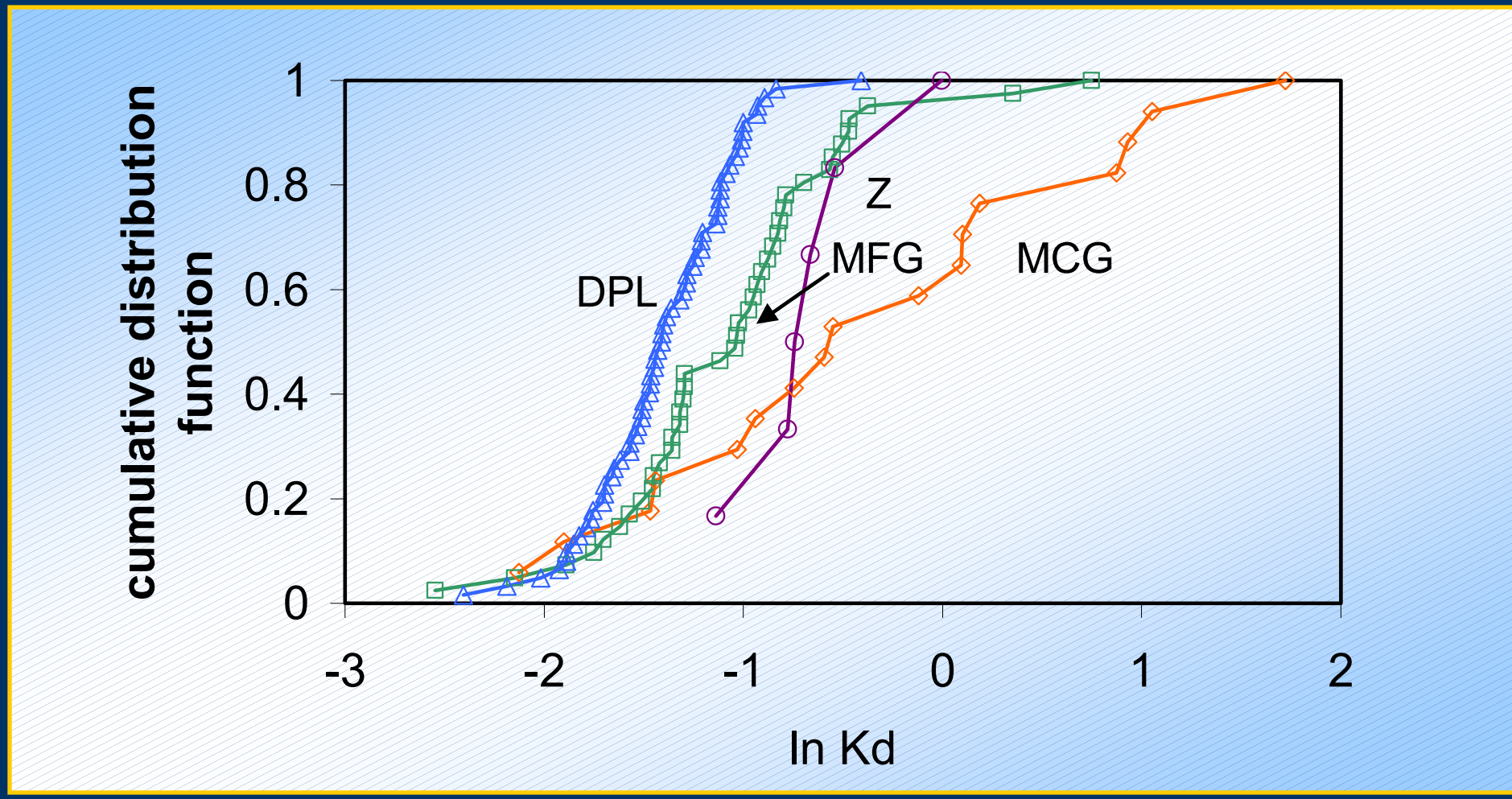
Permeability (k) distribution differs by lithofacies



Some lithofacies have distinct sorption signatures!



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Summary

- Aquifer physical and chemical properties correlate to lithofacies
- Lithofacies mapping may provide a means to estimate spatial property distributions efficiently

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